



Doc. Number :

- ☐ Tentative Specification
☒ Preliminary Specification
☐ Approval Specification

MODEL NO.: M190CGE
SUFFIX: L20

Customer: Common**APPROVED BY****SIGNATURE****Name / Title** _____

Note

Product Version C1

Please return 1 copy for your confirmation with your signature and comments.

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**REVISION HISTORY**

Version	Date	Page	Description
1.0	May.27, 2011	All	Spec Ver.1.0 was first issued.



1. GENERAL DESCRIPTION

1.1 OVERVIEW

M190CGE-L20 is a 19" TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 1ch-LVDS interface. This module supports 1440 x 900 WXGA+ mode and can display up to 16.7M colors. The converter module for Backlight is not built in.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	18.95" diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 x R.G.B. x 900	pixel	-
Pixel Pitch	0.2835 (H) x 0.2835 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-
Luminance, White	250	Cd/m2	
Color Gamut	CIE 1931 : 72%NTSC (typ.) CIE 1976 : 84%NTSC (typ.)	-	-
TCO	TCO 5.0 compliance		
Power Consumption	13.5W		(1)

Note (1) The specified power consumption : Total= cell (reference 4.3.1)+BL (reference 4.3.3)

2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	427.5	428	428.5	mm	(1)
	Vertical (V)	277.5	278	278.5	mm	
	Thickness (T)	10	10.5	11	mm	
Bezel Area	Horizontal	411.94	412.24	412.54	mm	
	Vertical	258.85	259.15	259.45	mm	
Active Area	Horizontal	-	408.24	-	mm	
	Vertical	-	255.15	-	mm	
Weight		1550	1600	1650	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	60	°C	(1)
Operating Ambient Temperature	TOP	0	50	°C	(1), (2)

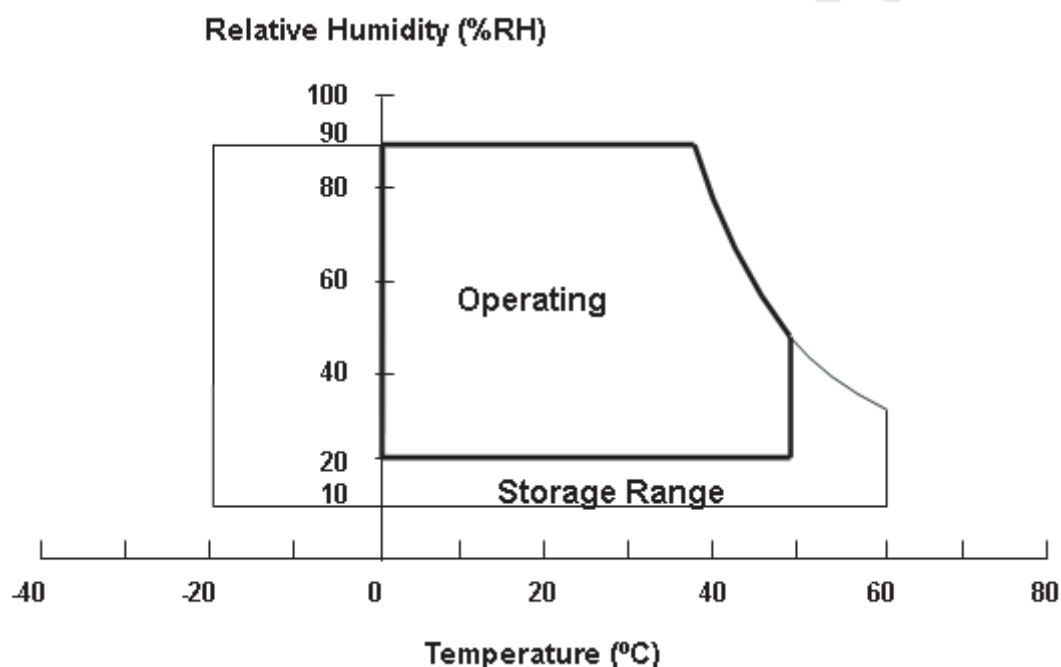
Note (1)

(a) 90 %RH Max. ($T_a \leq 40\text{ }^{\circ}\text{C}$).

(b) Wet-bulb temperature should be $39\text{ }^{\circ}\text{C}$ Max. ($T_a > 40\text{ }^{\circ}\text{C}$).

(c) No condensation.

Note (2) The temperature of panel surface should be $0\text{ }^{\circ}\text{C}$ min. and $60\text{ }^{\circ}\text{C}$ max.



3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

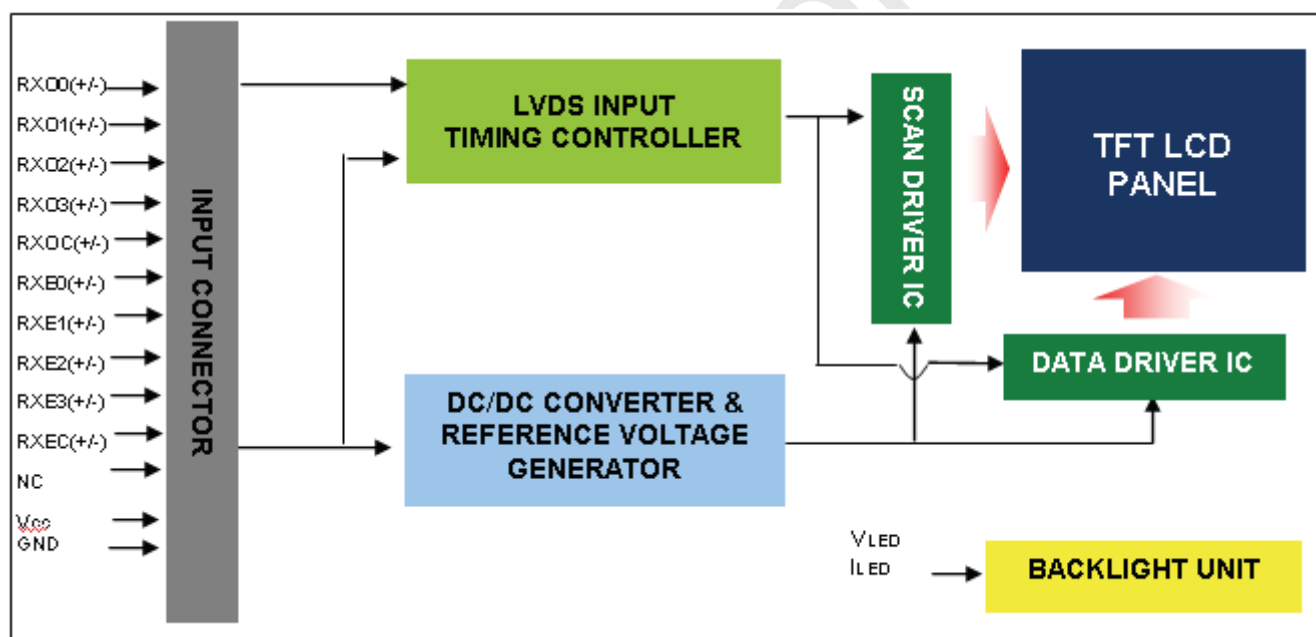
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	6.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	4.3	V	

3.2.2 BACKLIGHT UNIT

Item	Symbol	Value			Unit	Note
		Min.	Typ	Max.		
LED Forward Current Per Input Pin	IF	0	65	70	mA	(1), (2) Duty=100%
LED Reverse Voltage Per Input Pin	VR	---	---	45	V	
LED Pulse Forward Current Per Input Pin	IP	---	---	150	mA	(1), (2) Pulse Width $\leq 10\text{msec.}$ and Duty $\leq 10\%$

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at $T_a=25\pm 2\text{ }^{\circ}\text{C}$ (Refer to 4.3.3 and 4.3.4 for further information).

4. ELECTRICAL SPECIFICATIONS**4.1 FUNCTION BLOCK DIAGRAM**

**4.2. INTERFACE CONNECTIONS****PIN ASSIGNMENT**

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	Not connection, this pin should be open.
26	AGMODE	Enable Aging Mode (spec ref. to LCM TEST fixture A.) Enable:5V Disable:0V
27	NC	Not connection, this pin should be open.
28	VCC	+5.0V power supply (Dip condition: $4.0V \leq V_{cc} \leq 4.5V, T_d \leq 20ms$)
29	VCC	+5.0V power supply (Dip condition: $4.0V \leq V_{cc} \leq 4.5V, T_d \leq 20ms$)
30	VCC	+5.0V power supply (Dip condition: $4.0V \leq V_{cc} \leq 4.5V, T_d \leq 20ms$)

Note (1) Connector Part No.:

GS23302-0311R-7F (FOXCONN)orWF13-422-3033 (全康)or187098-30091(P-TWO) or equivalent

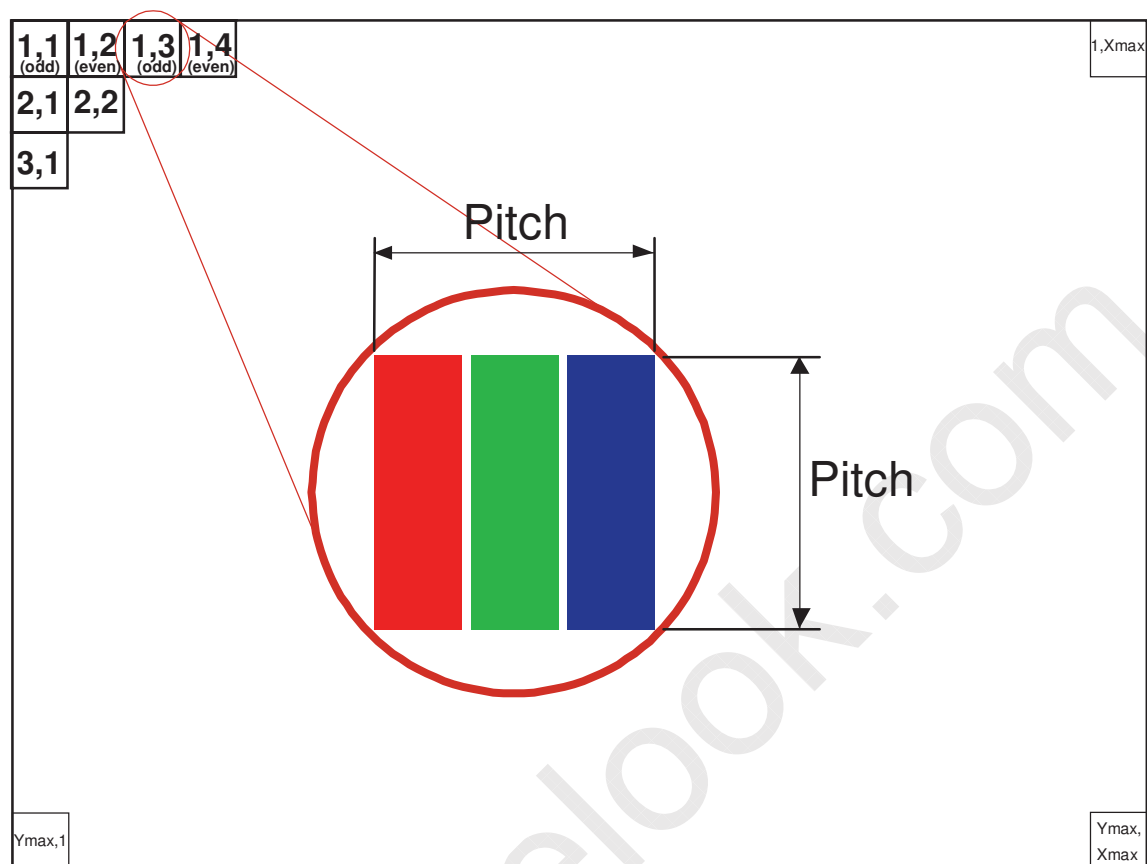
Note (2) User's connector Part No:

Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)

Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE).

Note (3) The first pixel is odd.

Note (4) Input signal of even and odd clock should be the same timing.



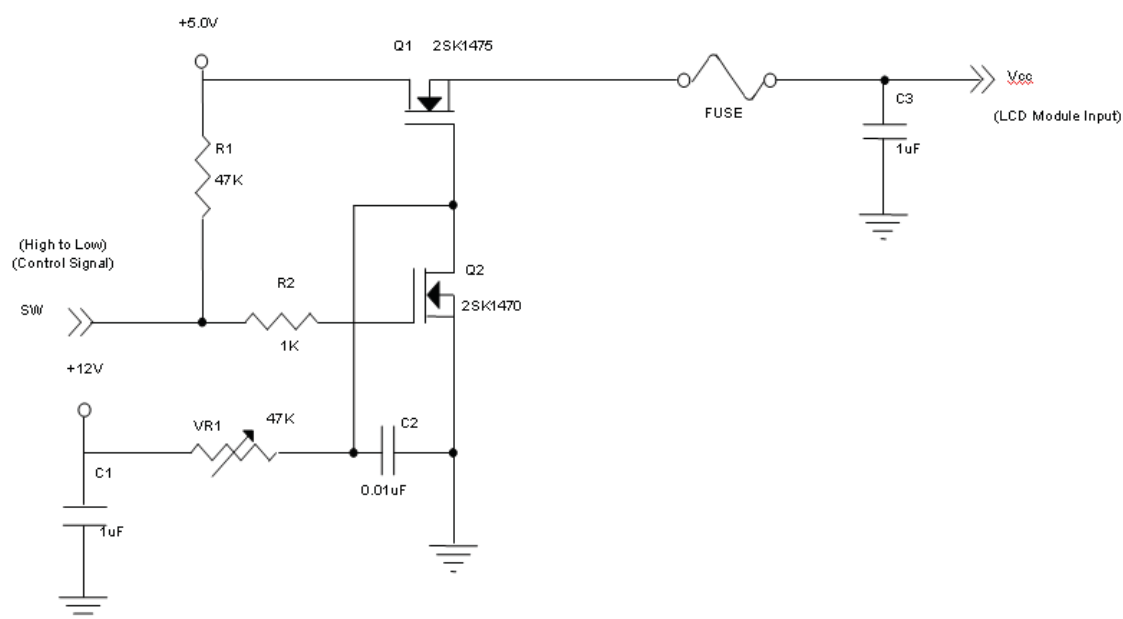
4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

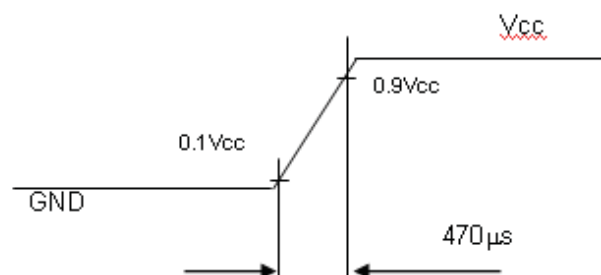
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V _{CC}	4.5	5.0	5.5	V	-
Ripple Voltage		V _{RP}	-	-	300	mV	-
Rush Current		I _{RUSH}	-	1.6	3	A	(2)
Power Supply Current	White		-	0.5	0.7	A	(3)a
	Black		-	0.7	1	A	(3)b
	Vertical Stripe		-	0.7	1	A	(3)c
Power Consumption		PLCD	-		5.5	Watt	(4)
LVDS differential input voltage		V _{id}	200	-	600	mV	
LVDS common input voltage		V _{ic}	-	1.2	-	V	
Logic High Input Voltage		V _{IH}			0.1	V	
Logic Low Input Voltage		V _{IL}	-0.1		0.7	V	

Note (1) The ambient temperature is $T_a = 25 \pm 2 \text{ }^\circ\text{C}$.

Note (2) Measurement Conditions:



Vcc rising time is 470μs



Note (3) The specified power supply current is under the conditions at $V_{cc} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $F_r = 75\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



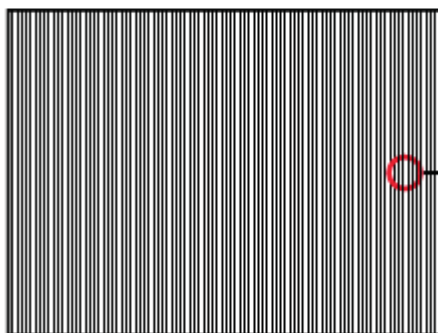
Active Area

b. Black Pattern

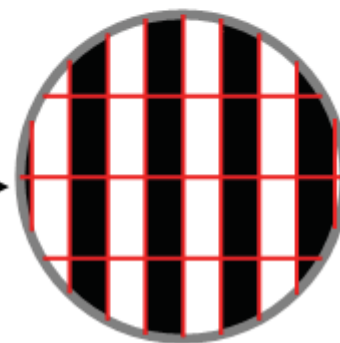


Active Area

c. Vertical Stripe Pattern

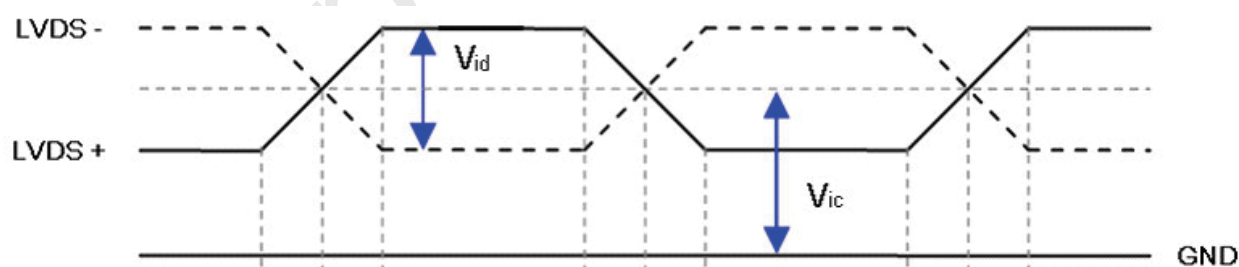


Active Area

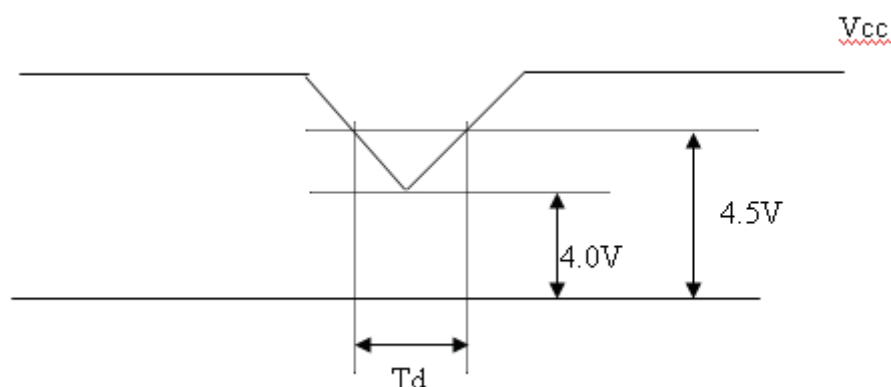


Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) VID waveform condition



4.3.2 Vcc Power Dip Condition



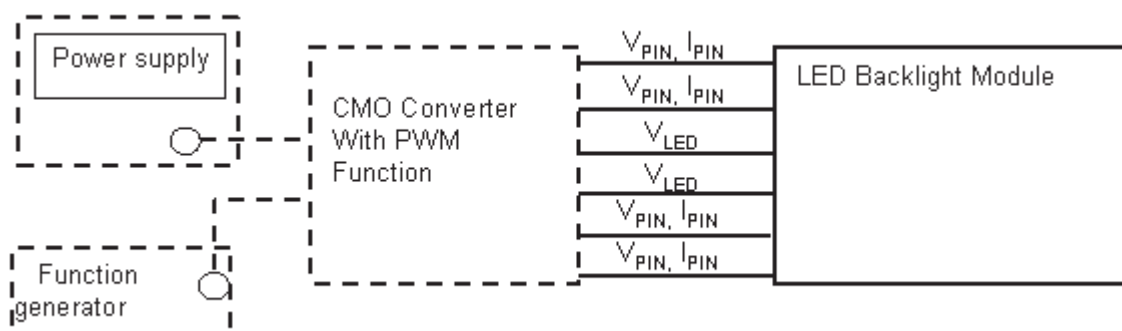
4.3.3 BACKLIGHT UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	VPIN	--	3.1	3.4	V	(1), Duty=100%, IPIN=50mA
LED Light Bar Current Per Input Pin	IPIN	0	65	70	mA	(1), (2) Duty=100%
LED Life Time	LLED	40000	---	---	Hrs	(3)
Power Consumption	PBL	---	7.3	8.0	W	(1) Duty=100%, IPIN=50mA

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

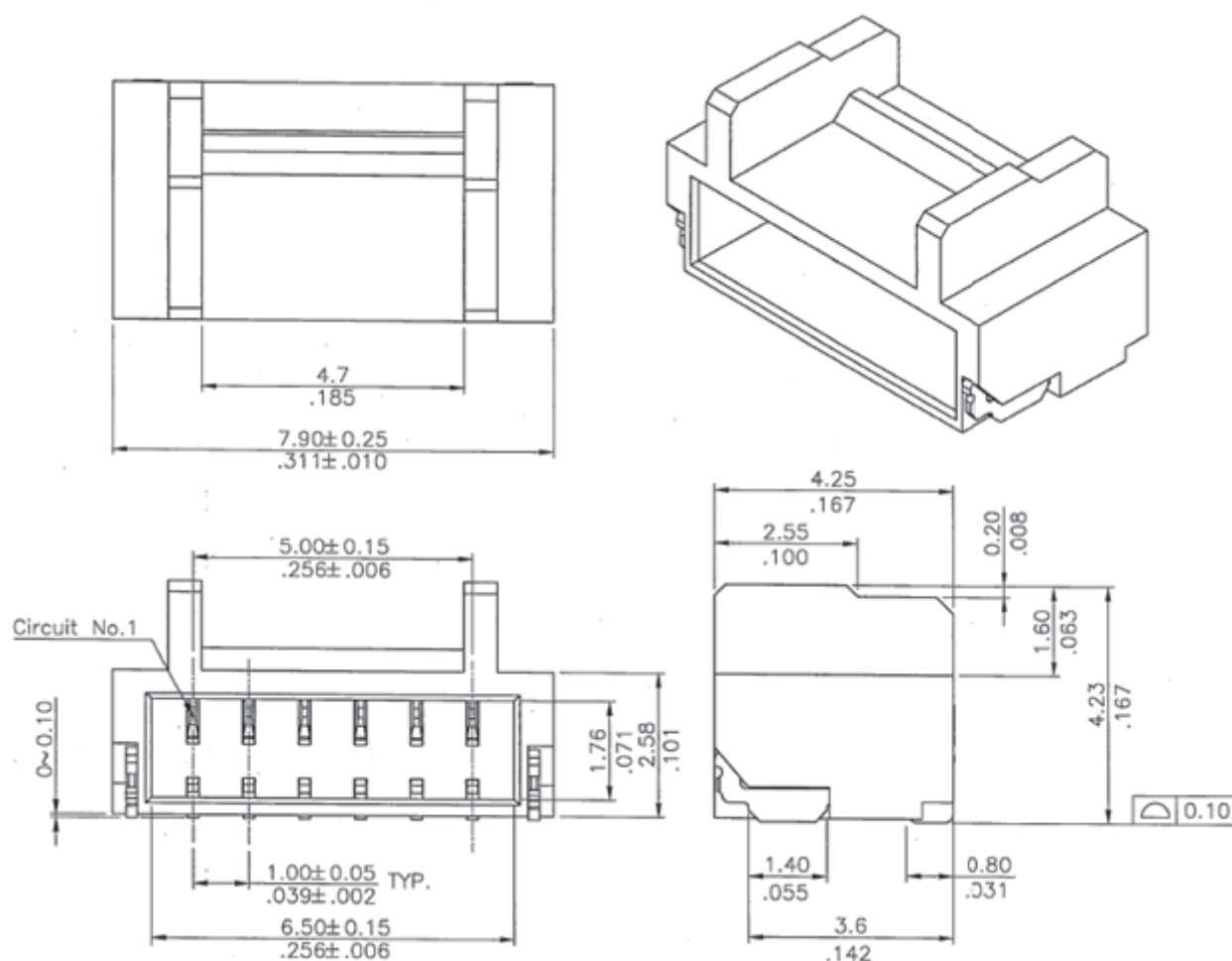
Note (2) $PBL = IPIN \times VPIN \times (4)$ input pins.

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at $T_a = 25 \pm 2^\circ\text{C}$ and $I = (65)\text{mA}$ (per chip) until the brightness becomes $\leq 50\%$ of its original value.



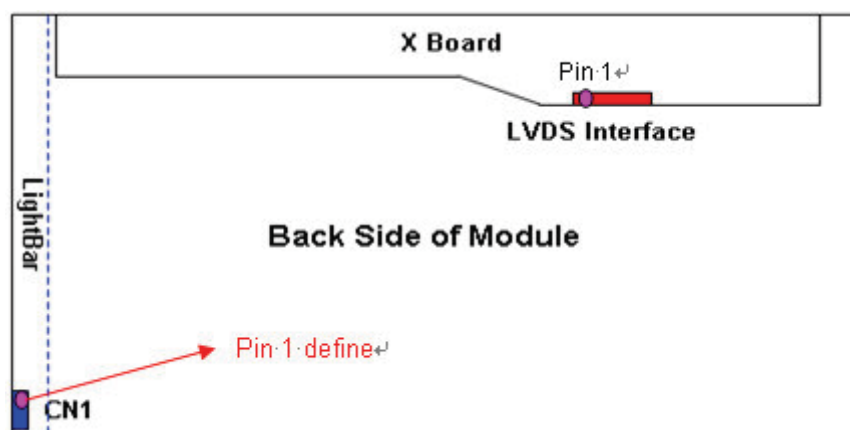
4.3.4 LIGHTBAR Connector Pin Assignment

Connector: Cvilux CI1406M1HRF-NH or FCN-WM13-406-063N_06



CN1

Pin number	Description
1	Cathode of LED string
2	Cathode of LED string
3	VLED
4	VLED
5	Cathode of LED string
6	Cathode of LED string



4.4 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 LVDS DATA MAPPING TABLE

LVDS Channel	O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
		Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel	O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
		Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel	O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
		Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel	O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
		Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel	E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
		Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel	E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
		Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel	E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
		Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel	E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
		Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6



4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

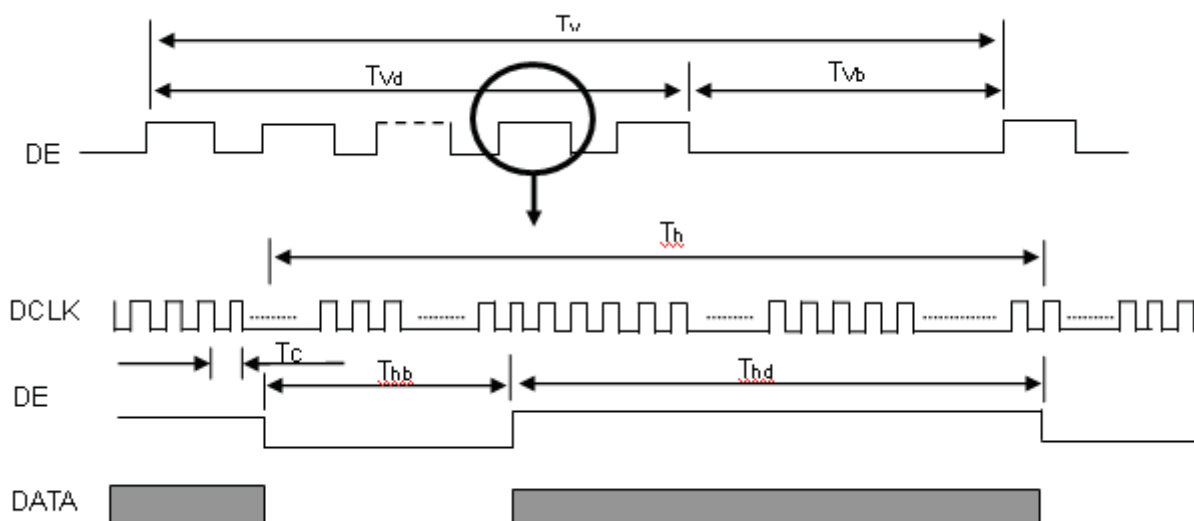
4.5 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

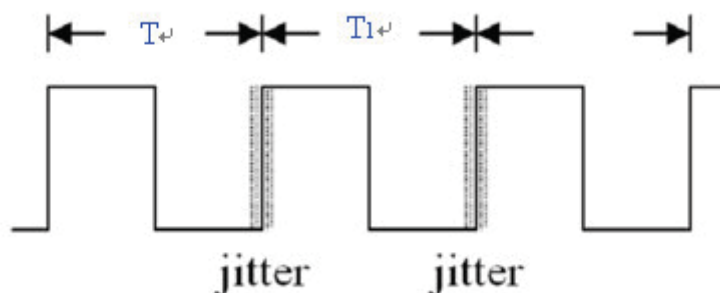
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	34	44.4	58	MHz	-
	Period	Tc	17.24	22.5	27	ns	
	Input cycle to cycle jitter	T _{rcl}	-0.02*Tc		0.02*Tc	ns	(1)
	Input Clock to data skew	TLVCCS	-0.02*Tc		0.02*Tc	ps	(2)
	Spread spectrum modulation range	F _{clkin_mod}	0.97*FC		1.03*FC	MHz	(3)
	Spread spectrum modulation frequency	F _{SSM}			100	KHz	
Vertical Display Term	Frame Rate	Fr	50	60	76	Hz	Tv=Tvd+Tvb
	Total	Tv	905	926	942	Th	-
	Active Display	Tvd	900	900	900	Th	-
	Blank	Tvb	5	26	42	Th	-
Horizontal Display Term	Total	Th	752	800	820	Tc	Th=Thd+Thb
	Active Display	Thd	720	720	720	Tc	-
	Blank	Thb	32	80	100	Tc	-

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

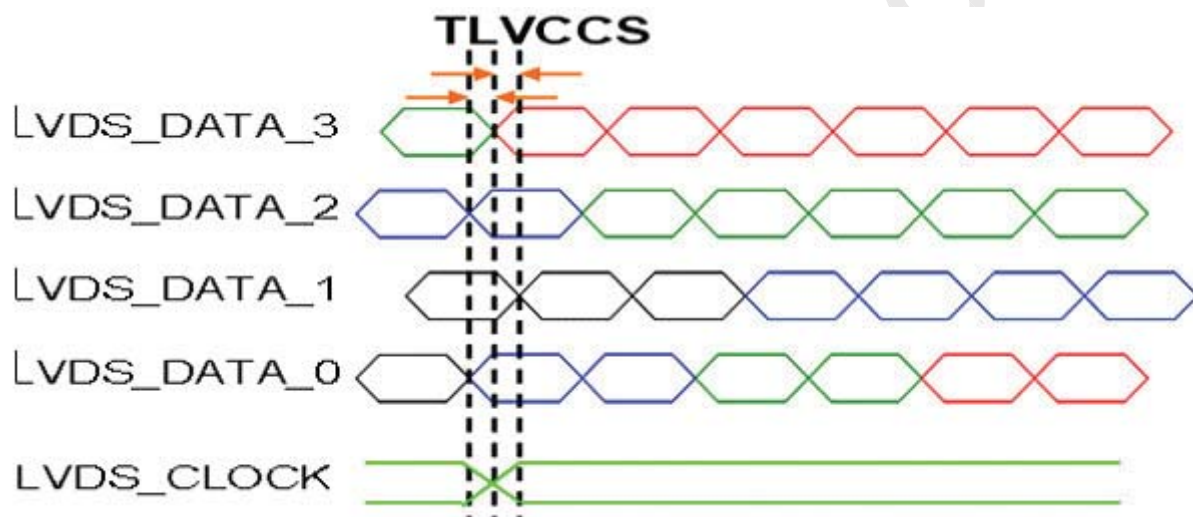
INPUT SIGNAL TIMING DIAGRAM



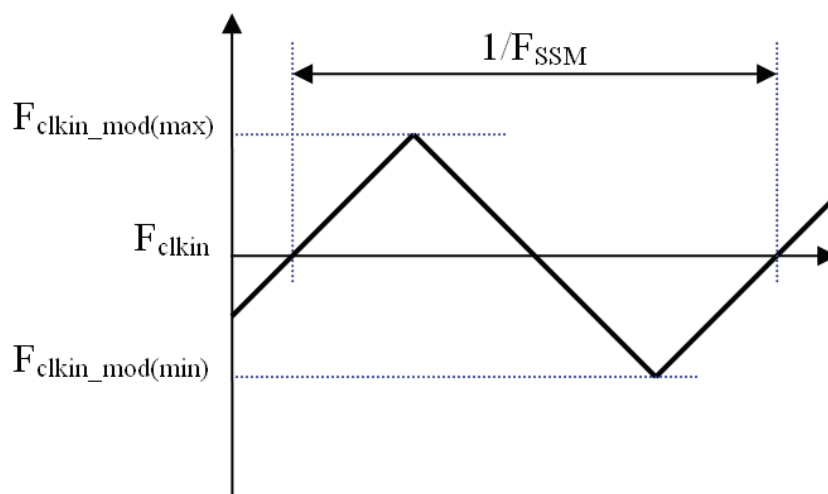
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T_1|$



Note (2) Input Clock to data skew is defined as below figures.

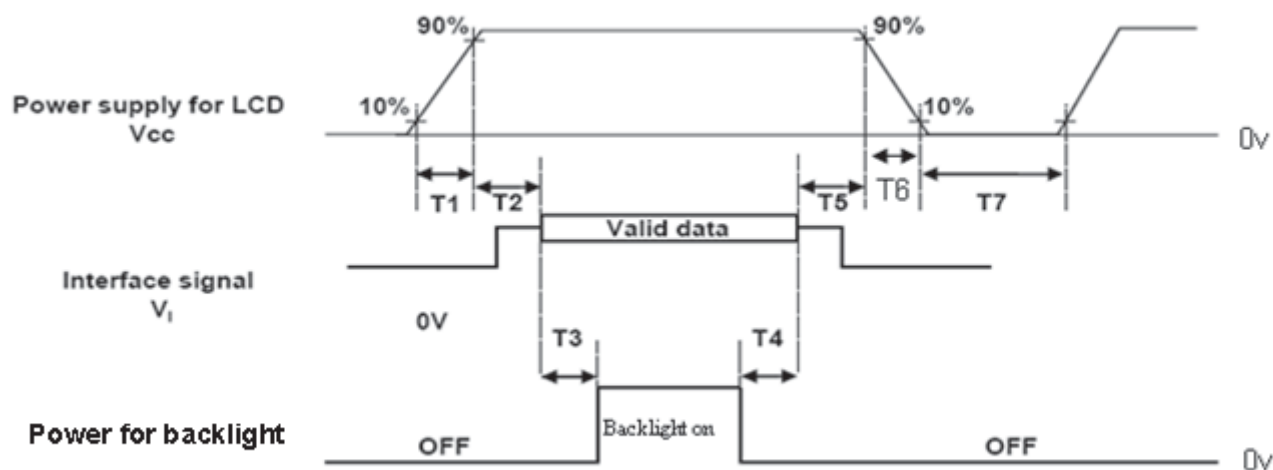


Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Timing Specifications:

Parameters	Values			Units
	Min	Typ.	Max	
T1	0.1		10	ms
T2	0	30	50	ms
T3	200	250		ms
T4	100	250		ms
T5	0	20	50	ms
T6	0.1		50	ms
T7	1000			ms

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) CMI won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".



5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

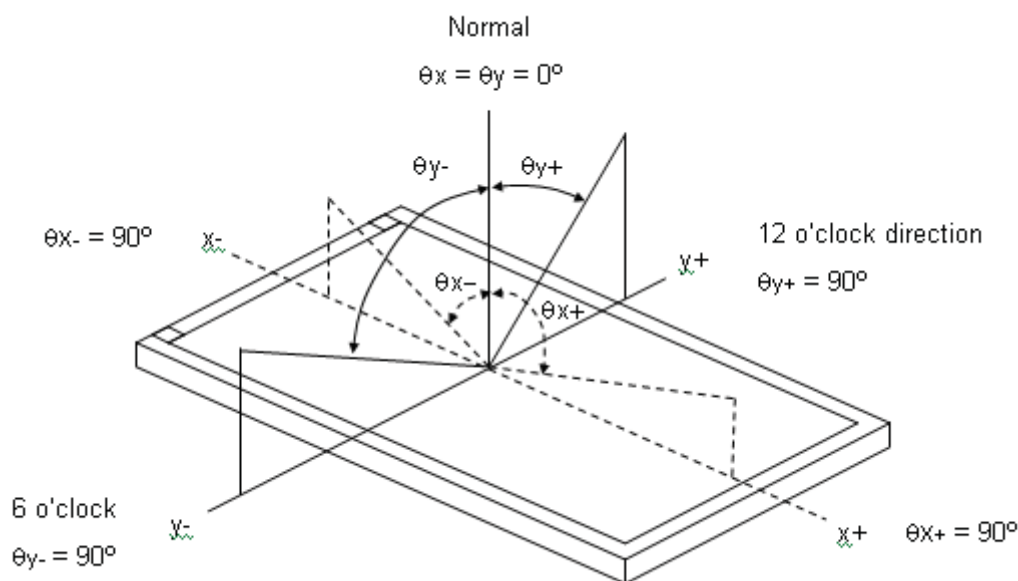
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VCC	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	IPIN	65 ± 1.9	mADC
PWM Duty Ratio	D	100	%
LED Light Bar Test Converter	CMI 27-D041745		

5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	R _x	$\theta_x=0^\circ, \theta_Y=0^\circ$ CS-2000 R=G=B=255 Gray scale	Typ – 0.03	(0.641)	Typ + 0.03	-	(1), (5)
		R _y			(0.338)			
	Green	G _x			(0.315)			
		G _y			(0.629)			
	Blue	B _x			(0.159)			
		B _y			(0.059)			
	White	W _x			0.313			
		W _y			0.329			
Center Luminance of White (Center of Screen)		L _C		200	250	-	cd/m ²	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		T _R	$\theta_x=0^\circ, \theta_Y=0^\circ$	-	1.5	2.5	ms	(3)
		T _F		-	3.5	5.5		
White Variation		W	$\theta_x=0^\circ, \theta_Y=0^\circ$	75	80	-	%	(5), (6)
Viewing Angle	Horizontal	$\theta_{x-} + \theta_{x+}$	CR ≥ 10	150	170	-	Deg.	(1), (5)
	Vertical	$\theta_{y-} + \theta_{y+}$		140	160	-		
Viewing Angle	Horizontal	$\theta_{x-} + \theta_{x+}$	CR ≥ 5	160	178	---	Deg.	(1), (5)
	Vertical	$\theta_{y-} + \theta_{y+}$		150	170	---		

Note (1) Definition of Viewing Angle (θ_x , θ_y):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

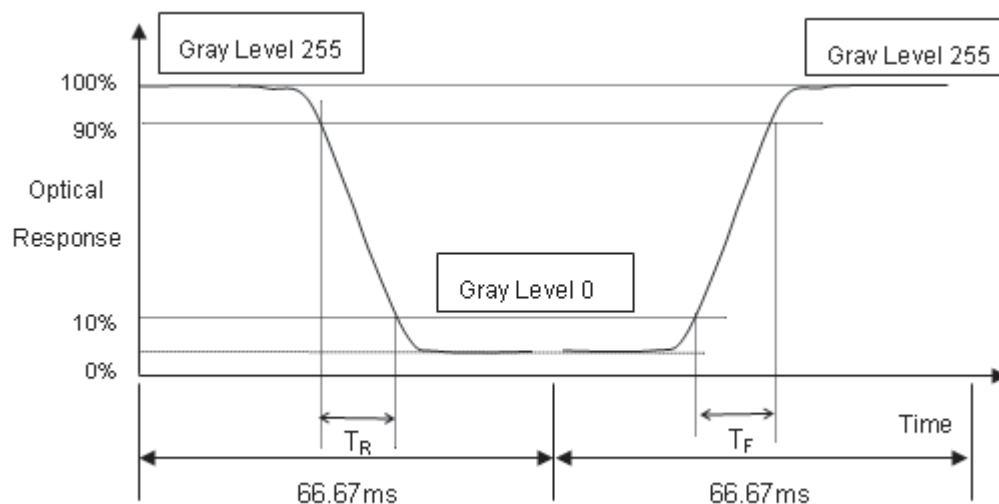
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R , T_F):



Note (4) Definition of Luminance of White (L_c):

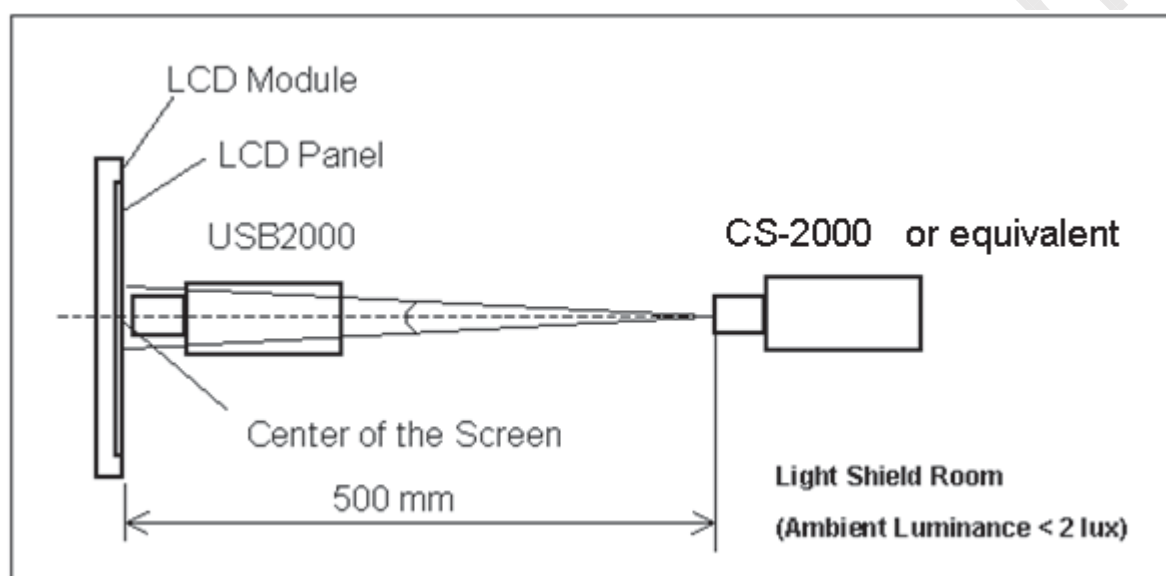
Measure the luminance of gray level 255 at center point

$$L_c = L(5)$$

$L(x)$ is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

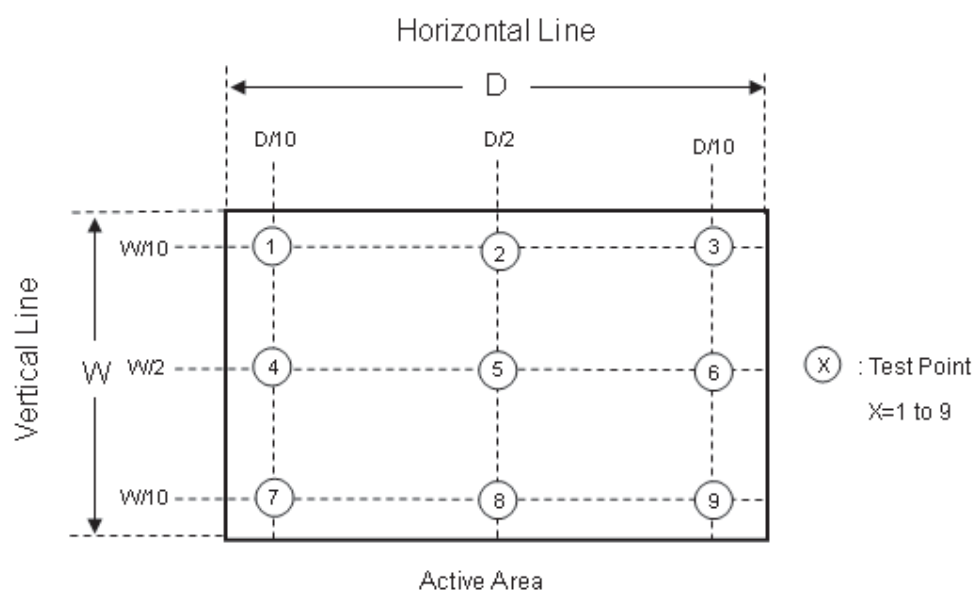
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

$$\delta W = (\text{Minimum } [L(1) \sim L(9)] / \text{Maximum } [L(1) \sim L(9)]) * 100\%$$



6. RELIABILITY TEST ITEM

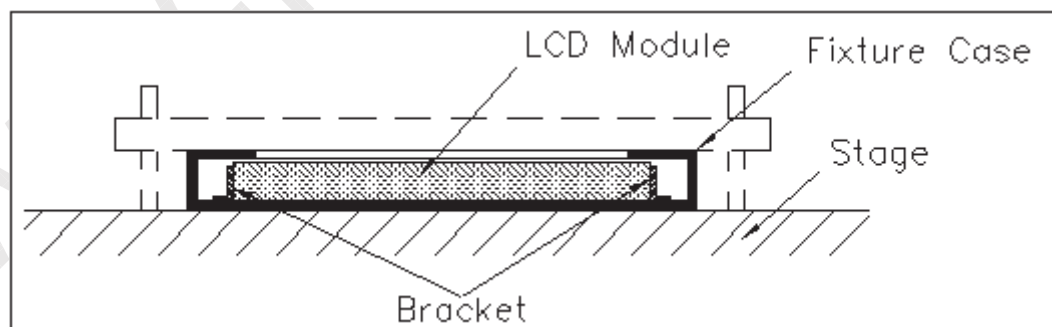
Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃ , 80%RH, 240hours	
High Temperature Operation (HTO)	Ta= 50℃ , 50%RH , 240hours	
Low Temperature Operation (LTO)	Ta= 0℃ , 240hours	
High Temperature Storage (HTS)	Ta= 60℃ , 240hours	
Low Temperature Storage (LTS)	Ta= -20℃ , 240hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Half-sine Frequency: 10 - 300 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 11 ms Direction : ± X, ± Y, ± Z.(one time for each Axis)	
Thermal Shock Test (TST)	-20℃/30min , 60℃ / 30min , 100 cycles	
On/Off Test	25℃ ,On/10sec , Off /10sec , 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω)	
	Air Discharge: ± 15KV, 150pF(330Ω)	
Altitude Test	Operation:10,000 ft / 24hours Non-Operation:30,000 ft / 24hours	

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hour

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:



7. PACKING

7.1 PACKING SPECIFICATIONS

- (1) 14 LCD modules / 1 Box
- (2) Box dimensions: 567(L) X 301(W) X 376(H) mm
- (3) Weight: approximately: 26.1 kg (14 modules per box)

7.2 PACKING METHOD

- (1) Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation
Dropping Test	1 Corner , 3 Edge, 6 Face, 45.7cm	Non Operation

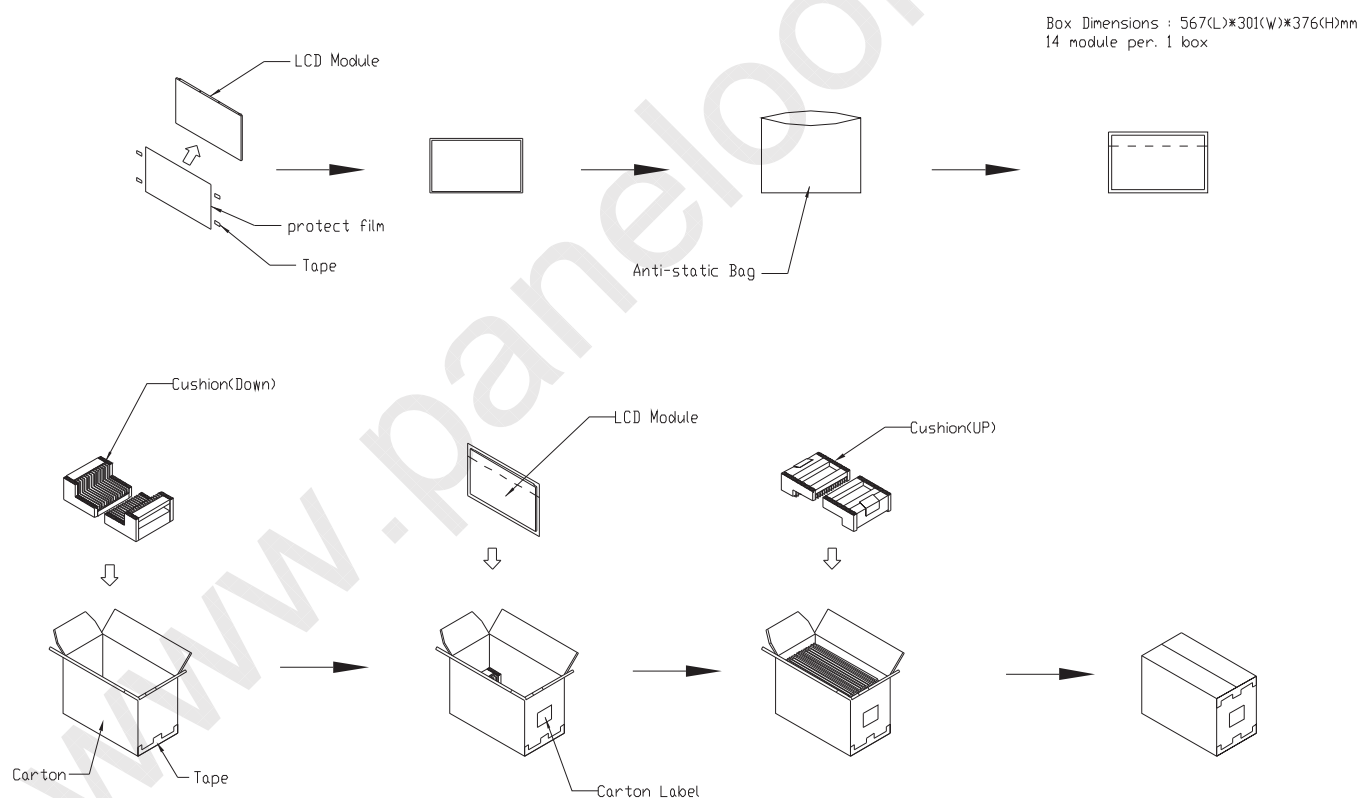


Figure. 7-1 Packing method



7.3 PALLET

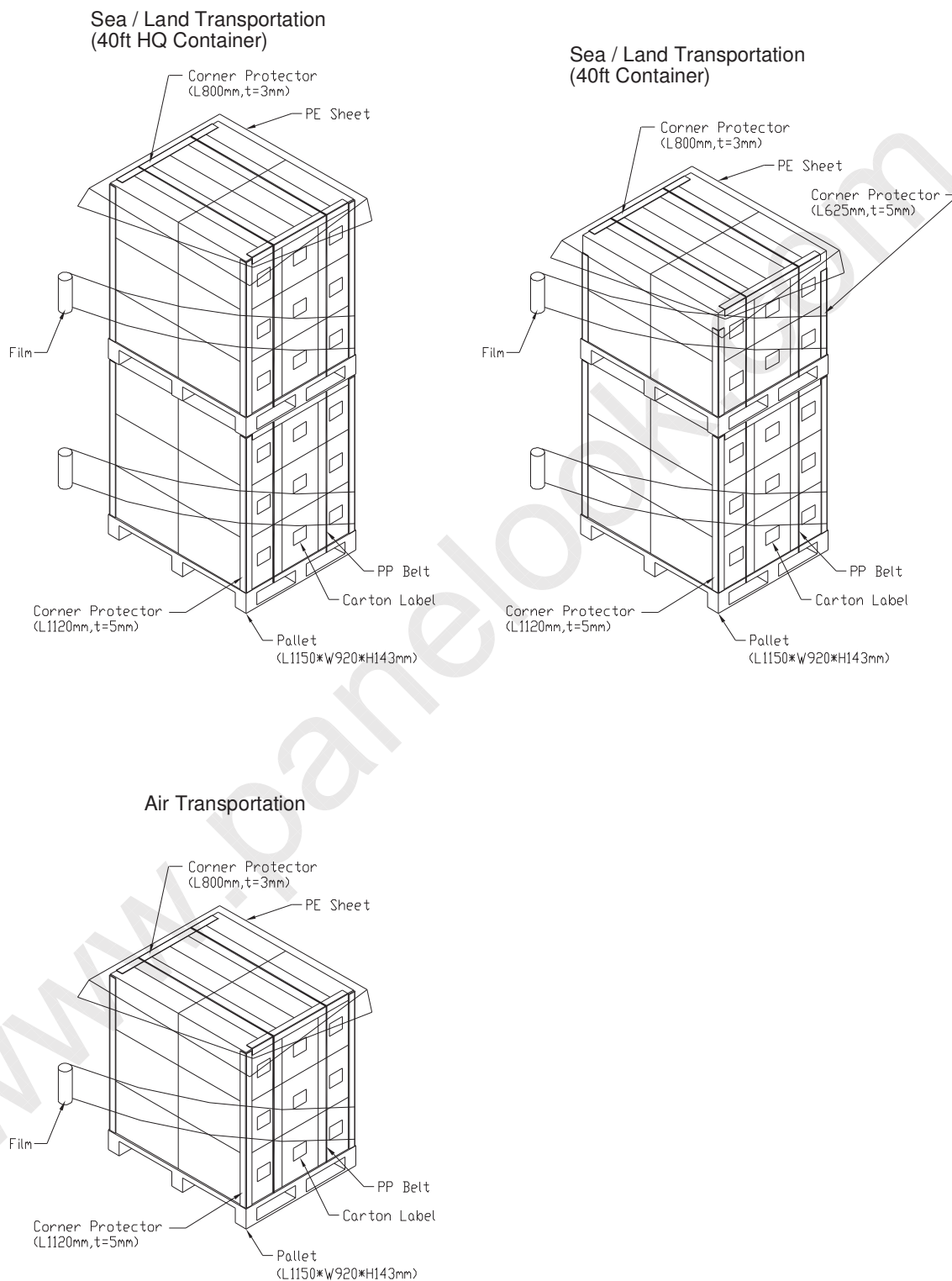
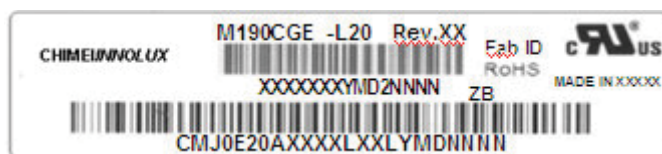


Figure. 7-2 Packing method

8. CMI MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: M190CGE-L20

(b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

(c) CMI barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMI internal use	-
XX	Revision	Cover all the change
X	CMI internal use	-
XX	CMI internal use	-
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2... Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3, ...
NNNN	Serial number	Manufacturing sequence of product

(d) Customer's barcode definition:

Serial ID: CM-J0E20-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMI=CM
J0E20	Model number	M190CGE-L20= J0E20
X	Revision code	Non ZBD: 1,2,~,8,9 / ZBD: A~Z
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C, OKI=D, Philips=E, Renesas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M, ILITEK=Q, Fiti=Y, None IC =Z
X	Gate driver IC code	
XX	Cell location	Tainan Taiwan=TN, Ningbo China=CN, Hsinchu Taiwan=SC
L	Cell line #	1,2,~,9,A,B,~,Y,Z
XX	Module location	Tainan, Taiwan=TN ; Ningbo China=NP, Shenzhen China=SH
L	Module line #	1,2,~,9,A,B,~,Y,Z
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2... Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	By LCD supplier



(e) FAB ID(UL Factory ID):

Region	Factory ID
TWCMI	GEMN
NBCMI	LEOO
NBCME	CANO
NHCM1	CAPG

9. PRECAUTIONS

9.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
- (4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
- (9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (10) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly.

9.2 STORAGE PRECAUTIONS

- (1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0°C to 35°C and relative humidity of less than 70%
- (2) Do not store the TFT – LCD module in direct sunlight
- (3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

9.3 OPERATION PRECAUTIONS

- (1) The LCD product should be operated under normal condition.

Normal condition is defined as below :

Temperature : 20±15°C

Humidity: 65±20%

Display pattern : continually changing pattern(Not stationary)



- (2) If the product will be used in extreme conditions such as high temperature, high humidity, high altitude, display pattern or operation time etc... It is strongly recommended to contact CMI for application engineering advice. Otherwise, its reliability and function may not be guaranteed.

9.4 SAFETY PRECAUTIONS

- (1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (2) After the module's end of life, it is not harmful in case of normal operation and storage.

9.5 SAFETY STANDARDS

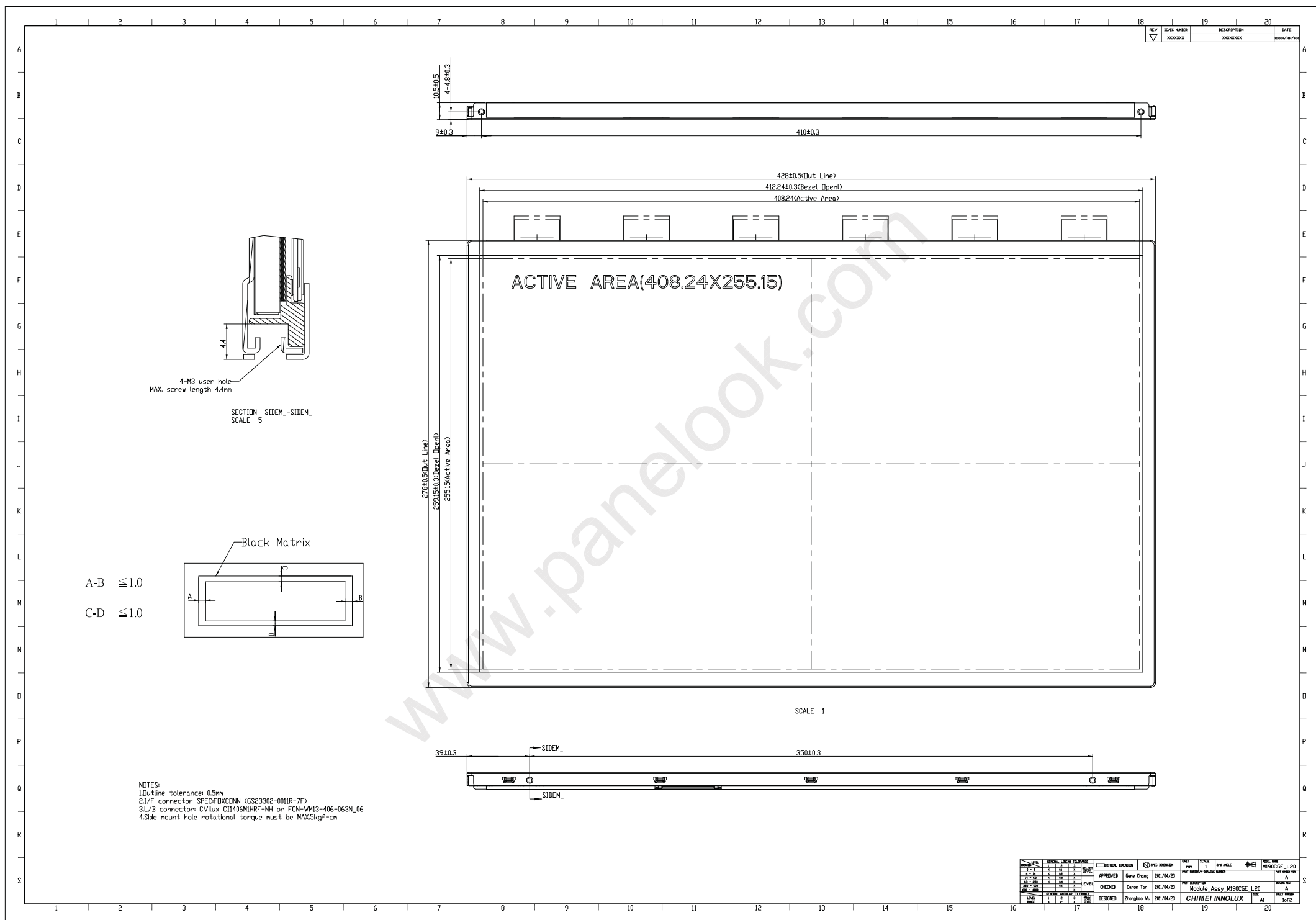
The LCD module should be certified with safety regulations as follows:

- (1) UL60950-1 or updated standard.
- (2) IEC60950-1 or updated standard.

9.6 OTHER

When fixed patterns are displayed for a long time, remnant image is likely to occur.

Appendix. OUTLINE DRAWING



<table border="1"> <tr> <th>LEVEL</th> <th>GENERAL LINEAR TOLERANCE</th> </tr> <tr> <td>0 - 4</td> <td>0.10</td> </tr> <tr> <td>4 - 6</td> <td>0.15</td> </tr> <tr> <td>6 - 12</td> <td>0.20</td> </tr> <tr> <td>12 - 25</td> <td>0.30</td> </tr> <tr> <td>25 - 50</td> <td>0.40</td> </tr> <tr> <td>50 - 100</td> <td>0.50</td> </tr> <tr> <td>100 - 200</td> <td>0.60</td> </tr> <tr> <td>200 - 500</td> <td>0.70</td> </tr> <tr> <td>500 - 1000</td> <td>0.80</td> </tr> <tr> <td>1000 - 2000</td> <td>0.90</td> </tr> <tr> <td>2000 - 5000</td> <td>1.00</td> </tr> <tr> <td>5000 - 10000</td> <td>1.20</td> </tr> <tr> <td>10000 - 20000</td> <td>1.50</td> </tr> <tr> <td>20000 - 50000</td> <td>1.80</td> </tr> <tr> <td>50000 - 100000</td> <td>2.00</td> </tr> <tr> <td>100000 - 200000</td> <td>2.50</td> </tr> <tr> <td>200000 - 500000</td> <td>3.00</td> </tr> <tr> <td>500000 - 1000000</td> <td>3.50</td> </tr> <tr> <td>1000000 - 2000000</td> <td>4.00</td> </tr> <tr> <td>2000000 - 5000000</td> <td>4.50</td> </tr> <tr> <td>5000000 - 10000000</td> <td>5.00</td> </tr> <tr> <td>10000000 - 20000000</td> <td>5.50</td> </tr> <tr> <td>20000000 - 50000000</td> <td>6.00</td> </tr> <tr> <td>50000000 - 100000000</td> <td>6.50</td> </tr> <tr> <td>100000000 - 200000000</td> <td>7.00</td> </tr> <tr> <td>200000000 - 500000000</td> <td>7.50</td> </tr> <tr> <td>500000000 - 1000000000</td> <td>8.00</td> </tr> <tr> <td>1000000000 - 2000000000</td> <td>8.50</td> </tr> <tr> <td>2000000000 - 5000000000</td> <td>9.00</td> </tr> <tr> <td>5000000000 - 10000000000</td> <td>9.50</td> </tr> <tr> <td>10000000000 - 20000000000</td> <td>10.00</td> </tr> <tr> <td>20000000000 - 50000000000</td> <td>10.50</td> </tr> <tr> <td>50000000000 - 100000000000</td> <td>11.00</td> </tr> <tr> <td>100000000000 - 200000000000</td> <td>11.50</td> </tr> <tr> <td>200000000000 - 500000000000</td> <td>12.00</td> </tr> <tr> <td>500000000000 - 1000000000000</td> <td>12.50</td> </tr> <tr> <td>1000000000000 - 2000000000000</td> <td>13.00</td> </tr> <tr> <td>2000000000000 - 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500000000000000000</td> <td>21.00</td> </tr> <tr> <td>500000000000000000 - 1000000000000000000</td> <td>21.50</td> </tr> <tr> <td>1000000000000000000 - 2000000000000000000</td> <td>22.00</td> </tr> <tr> <td>2000000000000000000 - 5000000000000000000</td> <td>22.50</td> </tr> <tr> <td>5000000000000000000 - 10000000000000000000</td> <td>23.00</td> </tr> <tr> <td>10000000000000000000 - 20000000000000000000</td> <td>23.50</td> </tr> <tr> <td>20000000000000000000 - 50000000000000000000</td> <td>24.00</td> </tr> <tr> <td>50000000000000000000 - 100000000000000000000</td> <td>24.50</td> </tr> <tr> <td>100000000000000000000 - 200000000000000000000</td> <td>25.00</td> </tr> <tr> <td>200000000000000000000 - 500000000000000000000</td> <td>25.50</td> </tr> <tr> <td>500000000000000000000 - 1000000000000000000000</td> <td>26.00</td> </tr> <tr> <td>1000000000000000000000 - 2000000000000000000000</td> <td>26.50</td> </tr> <tr> <td>2000000000000000000000 - 5000000000000000000000</td> <td>27.00</td> </tr> <tr> <td>5000000000000000000000 - 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4	0.10	4 - 6	0.15	6 - 12	0.20	12 - 25	0.30	25 - 50	0.40	50 - 100	0.50	100 - 200	0.60	200 - 500	0.70	500 - 1000	0.80	1000 - 2000	0.90	2000 - 5000	1.00	5000 - 10000	1.20	10000 - 20000	1.50	20000 - 50000	1.80	50000 - 100000	2.00	100000 - 200000	2.50	200000 - 500000	3.00	500000 - 1000000	3.50	1000000 - 2000000	4.00	2000000 - 5000000	4.50	5000000 - 10000000	5.00	10000000 - 20000000	5.50	20000000 - 50000000	6.00	50000000 - 100000000	6.50	100000000 - 200000000	7.00	200000000 - 500000000	7.50	500000000 - 1000000000	8.00	1000000000 - 2000000000	8.50	2000000000 - 5000000000	9.00	5000000000 - 10000000000	9.50	10000000000 - 20000000000	10.00	20000000000 - 50000000000	10.50	50000000000 - 100000000000	11.00	100000000000 - 200000000000	11.50	200000000000 - 500000000000	12.00	500000000000 - 1000000000000	12.50	1000000000000 - 2000000000000	13.00	2000000000000 - 5000000000000	13.50	5000000000000 - 10000000000000	14.00	10000000000000 - 20000000000000	14.50	20000000000000 - 50000000000000	15.00	50000000000000 - 100000000000000	15.50	100000000000000 - 200000000000000	16.00	200000000000000 - 500000000000000	16.50	500000000000000 - 1000000000000000	17.00	1000000000000000 - 2000000000000000	17.50	2000000000000000 - 5000000000000000	18.00	5000000000000000 - 10000000000000000	18.50	10000000000000000 - 20000000000000000	19.00	20000000000000000 - 50000000000000000	19.50	50000000000000000 - 100000000000000000	20.00	100000000000000000 - 200000000000000000	20.50	200000000000000000 - 500000000000000000	21.00	500000000000000000 - 1000000000000000000	21.50	1000000000000000000 - 2000000000000000000	22.00	2000000000000000000 - 5000000000000000000	22.50	5000000000000000000 - 10000000000000000000	23.00	10000000000000000000 - 20000000000000000000	23.50	20000000000000000000 - 50000000000000000000	24.00	50000000000000000000 - 100000000000000000000	24.50	100000000000000000000 - 200000000000000000000	25.00	200000000000000000000 - 500000000000000000000	25.50	500000000000000000000 - 1000000000000000000000	26.00	1000000000000000000000 - 2000000000000000000000	26.50	2000000000000000000000 - 5000000000000000000000	27.00	5000000000000000000000 - 10000000000000000000000	27.50	10000000000000000000000 - 20000000000000000000000	28.00	20000000000000000000000 - 50000000000000000000000	28.50	50000000000000000000000 - 100000000000000000000000	29.00	100000000000000000000000 - 200000000000000000000000	29.50	200000000000000000000000 - 500000000000000000000000	30.00	500000000000000000000000 - 1000000000000000000000000	30.50	1000000000000000000000000 - 2000000000000000000000000	31.00	2000000000000000000000000 - 5000000000000000000000000	31.50	5000000000000000000000000 - 10000000000000000000000000	32.00	10000000000000000000000000 - 20000000000000000000000000	32.50	20000000000000000000000000 - 50000000000000000000000000	33.00
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